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(54) Title: A PACKAGING LAMINATE, A METHOD OF PRODUCING THE PACKAGING LAMINATE, AS WELL AS PACKAGING CONTAINERS

(57) **Abstract**

The disclosure relates to liquid-tight packaging laminates with improved mechanical strength and flexibility, with an outer layer of a mixture of metallocene polyethylene and low density polyethylene (LDPE), and mechanically strong liquid-tight packaging containers produced from the packaging laminate. The packaging laminate also has improved friction properties and improved resistance to stress-cracking as a result of fat- or fatty acid-containing substances. The packaging laminate is produced in a simple, rational manner using existing processing and production machinery. A packaging laminate according to the invention (60) includes a core layer (61) of paper and at least one outer layer (66) including a mixture of metallocene-polyethylene and suitably at least approximately 10 % by weight, preferably approximately 10-50 % by weight, more preferably approximately 20-40 % by weight, and most preferably approximately 20-30 % by weight of LDPE. The packaging laminate may also include additional gas barrier layer (63) and adhesion layer (64; 65). The outer layer (66) is applied by extrusion coating or co-extrusion, and, thanks to its superior processing properties, can be applied by means of existing processing machinery at hight line speeds.

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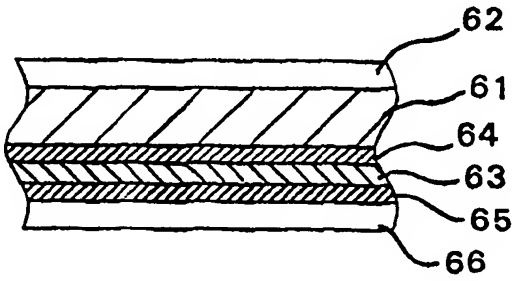

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A PACKAGING LAMINATE, A METHOD OF PRODUCING THE PACKAGING LAMINATE, AS WELL AS PACKAGING CONTAINERS

TECHNICAL FIELD

The present invention relates to a packaging laminate comprising a core layer of paper and at least one outer layer of metallocene-polyethylene. The present invention also relates to a method of producing the packaging laminate according to the invention, as well as packaging containers produced from the packaging laminate according to the invention.

BACKGROUND ART

Within the packaging technology, use has long been made of packages of a single-use nature, so-called single use disposable packages, for packing and transporting products such as, for example, liquid foods.

A large group of these single use disposable packages is produced from a laminated packaging material comprising a core layer of paper or paperboard and outer, liquid-tight coatings of plastic on both sides of the core layer, normally consisting of a thermoplastic polymer such as low density polyethylene (LDPE).

The composition of the packaging material is intended to impart to the packed product the best possible protection, at the same time as rendering the package itself both easy to produce and easy to handle. A core layer of paper or paperboard gives the package superior mechanical configurational stability, such that the package may be distributed in a simple and rational manner and be handled conveniently, at the same time as outer, liquid-tight coatings of plastic effectively protect the liquid-absorbing fibre core layer against the penetration of moisture and liquid which would otherwise rapidly weaken and destroy the core layer and thereby render the entire package sloppy and impossible to handle. In order to supplement the packaging material with barrier properties against light or gases, it is known in the art to apply different types of barrier layers between the core layer and the one outer plastic coating of the packaging material, and examples of such barrier layers are an aluminium foil (Alifoil) or a layer of a polymer possessing superior gas barrier properties, such as, for instance, ethyl vinyl alcohol (EVOH), polyamide or polyvinyl alcohol (PVOH).

Packaging containers made from such a laminated packaging material are often produced in that a continuous web of the packaging material is reformed into a tube by the longitudinal edges of the web being united to one another, whereafter the tube is filled with the intended contents and sealed along narrow, transverse and spaced apart sealing zones. The portions of the tube thus containing their contents and sealed-off from one another are then separated from the tube by means of incisions in the above-mentioned transverse sealing zones, and are formed by folding to optional geometric configuration depending upon how the sealing joint seams are oriented.

The usual outer, liquid-tight layers of LDPE in the above-described packaging container largely protect the packed product satisfactorily, but nevertheless suffer from a number of drawbacks. A conventional LDPE layer must be relatively thick in order to give sealing joints which are of sufficient mechanical strength and liquid-tightness.

Another problem is that a packaging laminate with outer layers of LDPE requires relatively high thermosealing temperatures which, at times, are so high that thermal degradation products which may taint the contents of the container can be formed.

Furthermore, the sealing process generally consumes more energy in sealing at higher temperatures. Because of the elevated sealing temperatures that are required, LDPE is less well-suited for ultrasound sealing, which is a rational and desirable sealing method per se known to a person skilled in the art.

Yet a further problem inherent in LDPE as the inside layer in a packaging container is its tendency to suffer from so-called "stress-cracking" because of its poor resistance to oils and other fatty substances. In the packing and storage of food products, such as, for example, cooking oil or tomato products for a lengthy period of time, fine cracks and failures giving a phenomenon known as environmental stress-cracking occur in an inside layer of LDPE. In order to counteract such stress-cracking, an extra oil resistant film is often applied on the inside of packaging containers intended for the storage of, for example cooking oil.

Moreover, polar flavour- and aromatic substances from a packed food product such as citrus juices diffuse or migrate to the inside layer of LDPE in lengthy storage, and flavour changes (so-called scalping) occur. This effect

may be remedied in a satisfactory manner by the application of two thinner layers (part layers) of LDPE on the inside of the packaging laminate, the outer layer being extruded at a lower temperature to a thin layer and thereby obtaining improved barrier properties against polar substances.

Japanese Patent Application JP-A-07148895 discloses a paper-based packaging laminate and paper-based food packages, in which packaging laminate the outer layer which, in the package, is in direct contact with the packed product (the inside layer) consists of an ethylene-a-olefin copolymer produced by polymerisation in the presence of a catalyst with a single active site ("single site catalyst"), a so-called metallocene-catalyst.

Such olefin copolymers are known for their superior mechanical strength properties such as, for example, high toughness, elasticity and flexibility, which make for improved strength properties even in a thin film. Ethylene copolymers produced in this manner, so-called metallocene-polyethylenes (m-PE), are moreover known for good "hot tack" properties and good thermosealing properties, and also that they melt and may be thermosealed at considerably lower temperatures than LDPE. For example, the transverse sealing joint seams in a package made of a packaging laminate as described above, in which the outer layers consist of m-PE (at a roughly 10°C lower sealing temperature than for LDPE), are approximately 1.5 to 2 times stronger than in a corresponding conventional package with outer layers of standard LDPE. As a result, metallocene-polyethylene is extremely well suited for ultrasound sealing methods. An inside layer of metallocene-polyethylene further enjoys better resistance to cracking or crocodiling because of contact with fatty and oily food products, or alcoholic beverages, than does LDPE.

This said, metallocene-polyethylene also suffers from a series of drawbacks. It has considerably poorer processing properties than LDPE on extrusion, in the form of exaggerated so-called "neck-in" effect and poorer so-called "draw-resonance". "Neck-in" implies that the width of the extruded layer shrinks just after outflow from the extruder nozzle, such that the final width of the layer will be considerably narrower than the width of the die nozzle. Poorer "draw-resonance" implies that layer thickness variations more readily occur in the extruded layer in extrusion coating, because of the flexural and tensile forces which act on the extruded layer between the extruder nozzle and the packaging material web. It will thus be more

difficult to extrude thin layers of uniform layer thickness. These poorer processing properties entail that extrusion and coating on the material web must take place at lower speed, and so production costs increase. Even if it may be possible to maintain a high extrusion lamination speed, this will still result in higher production costs, since the counter-pressure at extrusion of the polymer through the extruder die requires the extruders to be driven by more powerful engines and at increased power consumption. Normal rational, economical, state-of-the-art line speeds for extrusion and lamination of laminated packaging materials as described above are about 400 m/minute. Existing state-of-the-art machine equipment for crease-folding, filling and sealing of packages normally operate at a speed of about 5000-6000 packages per hour. The packaging industry are continously working for and aiming at production at still higher speed and efficiency.

On coating with a thicker outer layer, or a plurality of co-extruded layers, the mechanical strength and toughness of the plastic may, in addition, have as a result that division of the above-mentioned sealed-off portions of the tube carrying their intended contents is made more difficult in existing production machinery for cutting or incision along the transverse sealing zones.

Further, metallocene-polyethylene in the form of an outer layer on a packaging laminate or package, respectively, has poorer friction properties, i.e. a higher coefficient of friction, which may create difficulties in production, handling and distribution at such high production speeds.

Moreover, metallocene-polyethylene is considerably more expensive than LDPE, which entails a higher per unit cost.

OBJECTS OF THE INVENTION

One object of the present invention is therefore to realise a novel, improved packaging laminate with an outer layer of metallocene-polyethylene whose advantages vis-à-vis a corresponding conventional packaging laminate with outer layers of for example LDPE are retained, while the drawbacks inherent in the prior art technology are obviated.

A further object of the present invention is to realise a well-functioning packaging laminate as well as packages at reasonable cost, whose outer layers enjoy improved mechanical strength and flexibility, and which makes for stronger liquid-tight seals on reforming into packaging

containers, by means of the conversion of polymer material possessing superior processing properties in existing processing and production machinery at the high line speeds of today and even at future considerably higher line speeds.

Yet a further object of the present invention is to realise a packaging laminate and packages whose outer layers possess superior friction properties and thereby function without difficulty in production and handling of both laminate, and packages produced therefrom, in existing packaging and filling machines at such high line speeds.

Still a further object of the present invention is to realise a packaging laminate and packages whose inside layer possesses improved resistance to so-called "stress-cracking" under the action of oils and other fat- or fatty acid-containing substances, such as, for example, cooking oil tomato paste or ketchup, or alcoholic substances such as, for example, saké.

Yet a further object of the present invention is to realise a simple and rational method of producing the packaging laminate according to the invention using existing processing machinery at at least state of the art processing speed.

One particular object of the present invention is to realise mechanically strong and liquid-tight packaging containers possessing superior friction and stress-cracking properties.

SOLUTION

These and other objects will be attained by means of a laminated packaging material of the type described by way of introduction which has the characterizing feature as set forth in appended Claim 1. Preferred embodiments of the laminated packaging material according to the present invention are apparent from appended subclaims 2 to 7. A method of producing the packaging laminate according to the present invention possesses the characterizing feature as set forth in appended Claim 8, while preferred embodiments of the method according to the present invention are apparent from appended subclaims 9 and 10, respectively.

Furthermore, a packaging container will be realised according to the present invention as set forth in appended Claim 11, possessing superior strength, liquid-barrier and friction properties, produced from a packaging laminate according to the invention.

The above-disclosed so-called metallocene-catalysts are known to persons skilled in the art also as "single site" catalysts (referring to a single active site), and comprise a metallocene compound of a transition metal such as, for example, Titanium (Ti), Zirconium (Zr), Hafnium (Hf), or Vanadium (V) with cyclopentaindenyl-, tetrahydroindenyl- or furanyl groups, as well as an organic aluminium compound which functions as co-catalyst.

Metallocene-polyethylene qualities usable for the present invention are produced by copolymerisation of ethylene and a minor quantity of alpha-olefin. Examples of suitable alpha-olefins are propene, 1-butene, 3-methyl-1-butene, 4-methyl-1-pentene, 1-hexene, 1-octene, or decene, of which butene, pentene, hexene and octene are to be preferred. The alpha-olefin is normally copolymerised in a quantity of up to 15 % by weight. Usable copolymers according to the invention preferably have a lower density than 0.920 g/cm^3 and a melt index (MI) of between 6 and 8 g/10 min at 190°C and 2.16 kg (ASTM 1278).

Examples of commercially available, well-functioning polymers for the production of a packaging laminate according to the present invention are metallocene-polyethylenes of the type "Affinity"® from Dow Chemical or "Kernel"® from Mitsubishi. A particularly well-functioning example is an "Affinity-polyethylene" containing approximately 13.8% by weight of octene.

By applying, as outer layer in a packaging laminate including a core layer of paper or paperboard, a physical blend of a metallocene-polyethylene and conventional LDPE, a number of advantages will thus be attained as compared with the prior art technology. Suitably, the metallocene-polyethylene is mixed with at least 10% by weight of LDPE, preferably with approximately 10-50% by weight of LDPE, more preferably with approximately 20-40% by weight of LDPE, and according to one preferred embodiment, with approximately 20-30% by weight of LDPE.

The term conventional LDPE is taken to signify LDPE qualities suitable for conversion to outer layers in a packaging laminate, the LDPE preferably having a melt index of 4-12 g/10 min at 190°C and 2.16 kg. Particularly well-functioning LDPE types have a melt index of 6-8 g/10 min.

The poor processing properties of the metallocene-polyethylene are reduced by blending with conventional LDPE, whereby improved processing properties will be achieved such that processing can take place

without modification of the process in existing high speed processing machinery, such as melt mixers and extruders. An outer layer of such a mixture displays improved strength and flexibility vis-à-vis outer layers of conventional LDPE. In addition, such an outer layer makes for thermosealing at lower temperatures, with the result that improved and quicker thermosealing processing may be employed at the same time as the sealing joints will be stronger and more durable. As compared with a packaging laminate with outer layers of pure metallocene-polyethylene, there will also be obtained improved friction properties such that the packaging laminate may be employed in existing filling and packing machines, working at high line speeds, without difficulty. Quite surprisingly, a blend of m-PE with as low an amount of LDPE as 20 weight-%, has a friction coefficient equal to that of LDPE, even though the friction value of m-PE itself is the double of that of LDPE. Due to the superior processing properties of the blend according to the invention, it is expected that the line speed at extrusion lamination may be increased to about 600 m/minute in future machinery. At the same time it is expected that a laminate, having an innermost layer obtained by extrusion coating of a blend according to the invention, will allow also considerably higher sealing and packaging production speed in future developed machinery. As compared with packaging laminates with inside layers of LDPE, improved resistance to so-called "stress-cracking" will moreover be achieved.

The core layer in a packaging laminate according to the present invention consists of paper or paperboard of a suitable packaging quality.

The outer layer which, on reforming of the packaging laminate into packaging containers, is turned to face towards the inside of the packaging container - the inside layer - consists of a mixture of metallocene-polyethylene and LDPE. Suitably, the mixture contains at least 10% by weight of LDPE, preferably approximately 10-50% by weight of LDPE, more preferably approximately 20-40% by weight of LDPE, and most preferably approximately 20-30% by weight of LDPE. Such a composition of the inside layer makes for a strong sealing joint and, hence, packaging containers with improved resistance to mechanical stresses. At the same time, excellent processing and handling properties are achieved, enabling efficient, rational production technology both in the production of packaging laminate and of packages from the packaging laminate.

The inside layer may be divided into two adjacent layers, both consisting of a mixture of metallocene-polyethylene and preferably at least 10% by weight of LDPE with the same or different blend proportions. Alternatively, the first layer may consist of pure LDPE while only the outermost inside layer consists of a blend of metallocene-polyethylene and LDPE according to the present invention. Since a layer of such a blend displays improved mechanical strength properties in relation to corresponding layers of pure LDPE, a thinner layer may be applied as inside layer at a lower application temperature, whereby the effect will also be achieved that the inside layer obtains improved so-called non-scalping properties, i.e. improved barrier properties against polar flavour substances.

The outer layer on the opposing side of the packaging laminate, i.e. the outside layer of a packaging container produced from the packaging laminate, may also, according to a preferred embodiment of the invention, consist of a thermoplastic polymer such as LDPE or of a blend of metallocene-polyethylene and LDPE with the same or different blend proportions than the inside layer. Thus, also the outside layer of the packages will obtain optimal strength and mechanical properties towards the outside environment at handling and distribution at the same time as the friction problems, which are related to m-PE, are avoided.

In order to provide the packaging laminate with superior barrier properties against light or principally against gases, different layers of barrier material may be included in the laminate structure, such as, for example, a layer of a metal or a metal oxide. The most common procedure is, according to known techniques, to employ a foil of aluminium (Alifoil) or a layer of aluminium oxide or silica oxide (SiOx, where x may vary between 1.5 and 2.2) which has been deposited on a plastic film by means of known deposition techniques (e.g. vacuum deposition or plasma deposition - "Chemical Plasma Vapour Deposition - CPVD"). An Alifoil is, for example, laminated to that side of the core layer which is directed towards the inside of the package by means of an interjacent layer of adhesion polymer, LDPE, metallocene-polyethylene or a blend of metallocene-polyethylene and LDPE with the same or other mixture proportions as in the above-mentioned outer laminate layer.

The inside layer of a blend of metallocene-polyethylene and LDPE can be applied directly to the above-mentioned Alifoil. On application of

two thinner part layers which are to constitute the liquid barrier on the inside of the package, the first part layer may consist exclusively of LDPE, while the outermost part layer consists of a blend of metallocene-polyethylene and LDPE according to the present invention. Alternatively, the inside layer may be bonded to the Alifoil by the intermediary of a layer of an adhesive polymer, such as, for example, ethylene acrylic acid copolymer, ethylene metacrylic acid copolymer, acid or anhydride-modified polyolefin or ionomer polymer. Examples of these types of commercially available, usable adhesives are Surlyn® and Primacor®. Preferably, use is made of an adhesive of ethylene acrylic acid copolymer.

Other types of barrier materials may also be employed in a gas barrier layer such as, for example, polyvinyl alcohol (PVOH), ethyl vinyl alcohol (EVOH), polyester, such as polyethylene terephthalate (PET), or polyamide. Such a gas barrier layer of a polymer material is preferably laminated to the inside of the core layer by means of an adhesive layer of the above-mentioned type, applied on each side of the gas barrier layer. Preferably, use is made of an ethylene acrylic acid copolymer in both of the adhesive layers.

The outer layer or layers of a mixture of metallocene-polyethylene and LDPE are applied by means of extrusion coating. Extrusion coating may take place by the extrusion of one coating layer or by the co-extrusion of two or more part layers. The outer layer may also be co-extruded with adjacent layers of, for example, an adhesive polymer, or LDPE.

Blending of the metallocene-polyethylene and the LDPE is achieved by means of mixing techniques known to a person skilled in the art, such as, for example, dry mixing of granules or powder or melt mixing in various types of mixers or extruders under the supply of heat, and may take place separately or in connection with the extrusion coating.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The present invention will now be described in greater detail hereinbelow, with reference to the accompanying Drawings, in which:

Fig. 1 schematically illustrates a cross section through a laminated packaging material 10 according to the present invention;

Fig. 2 schematically illustrates a cross section through a laminated packaging material 20 according to the present invention;

Fig. 3 schematically illustrates a cross section through a laminated packaging material 30 according to the present invention;

Fig. 4 schematically illustrates a cross section through a laminated packaging material 40 according to the present invention;

Fig. 5 schematically illustrates a cross section through a laminated packaging material 50 according to the present invention; and

Fig. 6 schematically illustrates a cross section through a laminated packaging material 60 according to the present invention.

It should be observed that the particularly selected laminate structures shown in the Figures merely serve as examples of numerous other conceivable alternatives known to a person skilled in the art, and that various modifications and variations may be implemented by adding further material layers, with or without interjacent adhesive or lamination layers, with a view to satisfying the demands on best possible product protection, without departing from the inventive concept as this is defined in the appended Claims.

DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 thus schematically illustrates a cross section of a packaging laminate according to the invention, carrying the generic reference numeral 10. The packaging laminate includes a core layer 11 of paper or paperboard of a suitable packaging quality, an outer layer of LDPE 12 on that side of the packaging laminate which, on reforming into a packaging container, forms the outside of the packaging container, and an outer layer 13 on the opposing side of the packaging laminate (corresponding to the inside of the packaging container), consisting of a blend of metallocene-polyethylene and at least 10% by weight of LDPE, preferably 10-50% by weight of LDPE, more preferably 20-40% by weight of LDPE, and most preferably 20-30% by weight of LDPE. The outer layer 12 may also consist of a blend of metallocene polyethylene and LDPE with the same or different blend proportions as the layer 13. The outer layers 12 and 13, respectively are preferably applied by means of extrusion coating on a paper web.

Fig. 2 illustrates a packaging laminate 20 in which the core layer 21 and the outer layer 22 are of the same type as layers 11 and 12, respectively, in Fig. 1, while the inside of the packaging laminate consists instead of two layers 23 and 24, each consisting of a blend of metallocene-polyethylene and

at least 10% by weight of LDPE, preferably 10-50% by weight of LDPE, more preferably 20-40% by weight of LDPE, and most preferably 20-30% by weight of LDPE, with the same or different blend proportions. The outer layer 24 may be applied by means of co-extrusion with the layer 23.

Fig. 3 shows a packaging laminate 30 in which the core layer 31, the outer layer 32 and the inside layers 35 and 36 are of the same type as the layers 21, 22 and 23, 24, respectively in Fig. 2, but which moreover includes a gas barrier layer of Alifoil 33. The Alifoil 33 is laminated to the core layer 31 by means of an interjacent layer of a polyethylene selected from the group essentially comprising LDPE, metallocene-polyethylene or a blend thereof. An interjacent layer of LDPE is applied in a quantity of approximately 20-25 g/m^2 in order to impart to the packaging laminate sufficient strength and flexibility. If, instead, the metallocene-polyethylene (or preferably a blend of metallocene-polyethylene and LDPE) is employed, a smaller quantity of polymer, such as, for example, 10-20 g/m^2, may be applied in order to achieve the same or even improved mechanical properties.

The outer layer 36 may be coated by means of extrusion or co-extrusion with the layer 35 to the remaining packaging material web with the surface layer 33.

Fig. 4 shows a packaging laminate 40 in which the core layer 41, the outer layer 42, the gas barrier layer 43 and the lamination layer 44 are of the same types as layers 31, 32, 33 and 34, respectively, in Fig. 3, while the inside of the packaging laminate consists of an inside layer 46 comprising a blend of metallocene-polyethylene and at least 10% by weight of LDPE, preferably 10-50% by weight of LDPE, more preferably 20-40% by weight of LDPE, and most preferably 20-30% by weight of LDPE. The inside layer 46 is bonded to the Alifoil 43 by means of an adhesive layer of an ethylene acrylic acid copolymer 45. Such a packaging laminate is particularly well suited for the packing of, for example, juice, in order to maintain good adhesion between the inside layer and the Alifoil, and also obtain superior barrier properties against polar flavouring substances. The outer layer 46 is preferably applied by means of co-extrusion with the adhesive layer 45, but both layers may also be applied separately.

Fig. 5 shows a packaging laminate 50 including a gas barrier layer consisting of EVOH or polyamide 53, the gas barrier layer having been integrated in the packaging laminate by means of surrounding adhesive

layers 55 and 56, of an ethylene acrylic acid copolymer. The core layer 51, the outer layer 52, the lamination layer 54 and the inside layer 57 are of the same types as corresponding layers 41, 42, 44 and 46, respectively, in the packaging laminate 40 in Fig. 4.

The gas barrier layer 53 may be replaced by other polymer layers possessing gas barrier properties known to persons skilled in the art, such as, for example, PVOH or PET.

Fig. 6 shows an alternative packaging laminate 60, to all essentials corresponding to the packaging laminate 50 in Fig. 5, apart from the fact that the gas barrier layer 63 is bonded direct to the core layer 61 by means of the adhesive layer 64, of an ethylene acrylic acid copolymer.

The outer layers 57 and 66 in Figs. 5 and 6, respectively, are coated by means of an extrusion or co-extrusion with adjacent polymer layers.

The application quantity of the blend of the metallocene-polyethylene and LDPE according to the present invention is adapted to the type of gas barrier layer, and also the presence of any possible adhesive layers, but it generally applies that a conventional inside layer of LDPE may be replaced by a thinner inside layer of a mixture according to the present invention. For example, a layer of a mixture of approximately 20-40% by weight of LDPE and approximately 60-80% by weight of metallocene-polyethylene applied in a quantity of approximately 10-20 g/m^2 may replace an inside layer of approximately 20-25 g/m^2 of conventional LDPE in a packaging laminate with a gas barrier layer of Alifoil. Generally, 5-10, advantageously about 10 g/m2 less of the blend than of LDPE alone may be used in an outer layer, at maintained mechanical properties.

It will thus be apparent from the foregoing description that the present invention, in a simple manner and by simple means, satisfies the established objects and realises an efficiently laminated packaging material possessing superior strength and flexibility in order better to withstand mechanical stresses, superior thermosealing properties which make for strong, tight seals on reforming into packaging containers, superior friction properties in production and handling, superior non-scalping properties, as well as improved resistance to stress-cracking in the packing of oily products. The packaging containers produced from the packaging laminate are stronger and more durable against mechanical stress on transport and handling and, at the same time, provided at an acceptable production cost.

Production of the packaging laminate may be put into effect in a simple manner with already existing extrusion and lamination machinery.

WHAT IS CLAIMED IS:

1. A packaging laminate (10; 20; 30; 40; 50; 60) including a core layer (11; 21; 31; 41; 51; 61) of paper and at least one outer layer (13; 24; 36; 46; 57; 66) of metallocene-polyethylene, **characterized in that** said outer layer moreover includes low density polyethylene (LDPE).

2. The packaging laminate as claimed in Claim 1, **characterized in that** said outer layer (13; 24; 36; 46; 57; 66) is a mixture of metallocene-polyethylene and LDPE, containing at least 10% by weight of LDPE.

3. The packaging laminate as claimed in Claim 2, **characterized in that** said outer layer (13; 24; 36; 46; 57; 66) is a mixture containing 10-50% by weight of LDPE.

4. The packaging laminate as claimed in Claim 3, **characterized in that** said outer layer (13; 24; 36; 46; 57; 66) is a mixture containing 20-40% by weight of LDPE.

5. The packaging laminate as claimed in Claim 4, **characterized in that** said outer layer (13; 24; 36; 46; 57; 66) is a mixture containing 20-30% by weight of LDPE.

6. The packaging laminate (30; 40; 50; 60) as claimed in any of Claims 1 to 5 **characterized in that** it includes, between the core layer (31; 41; 51; 61) and the outer layer (36; 46; 57; 66), a gas barrier layer (33; 43; 53; 63).

7. The packaging laminate (40; 50; 60) as claimed in Claim 6, **characterized in that** it includes an adhesion layer (45; 56; 65) between the gas barrier layer (43; 53; 63) and said outer layer (46; 57; 66) and/or (55; 64) between the gas barrier layer (53; 63) and the core layer (51; 61).

8. A method of producing a packaging laminate as claimed in any of Claims 1 to 7, **characterized in that** a layer of a mixture of metallocene-polyethylene and LDPE is applied on both outer sides of the core layer.

9. The method as claimed in Claim 8, **characterized in that** said layer (13; 24; 36; 46; 57; 66) is applied by means of extrusion coating on, or co-extrusion with adjacent layers on one or both outer sides of the packaging laminate.

10. The method as claimed in Claim 8, **characterized in that** the layer (13; 24; 36; 46; 57; 66) is applied by means of fine lamination to adjacent layers on one or both outer sides of the packaging laminate.

11. Packaging containers produced from a packaging laminate as claimed in any of Claims 1 to 7.

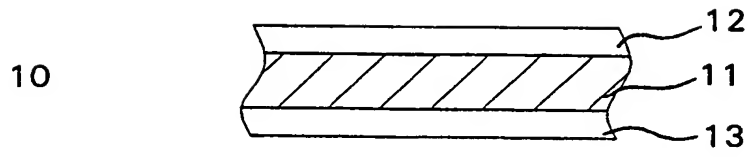

Fig 1

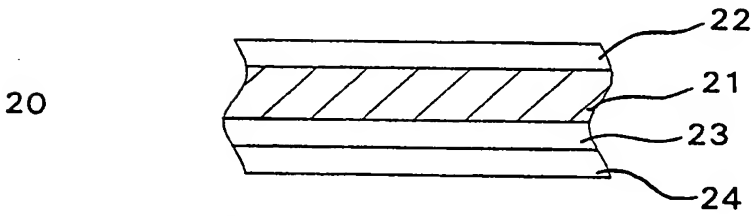

Fig 2

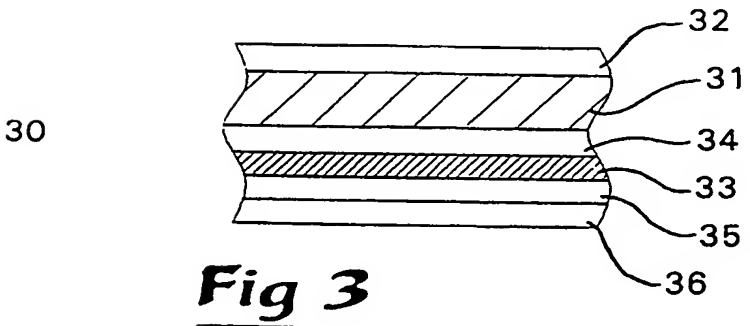

Fig 3

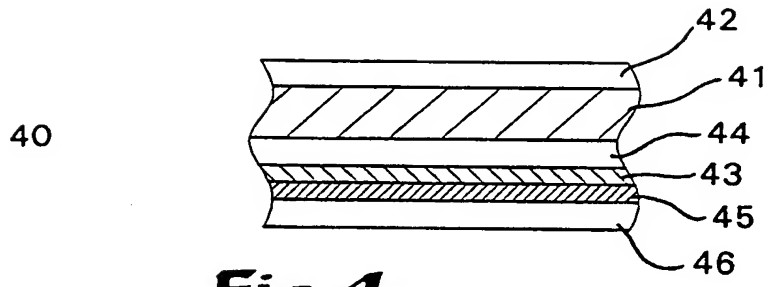

Fig 4

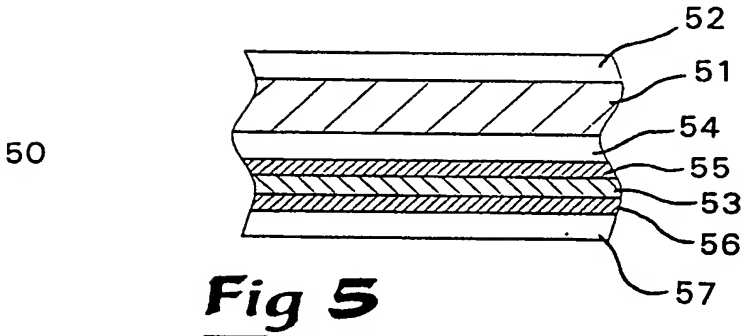

Fig 5

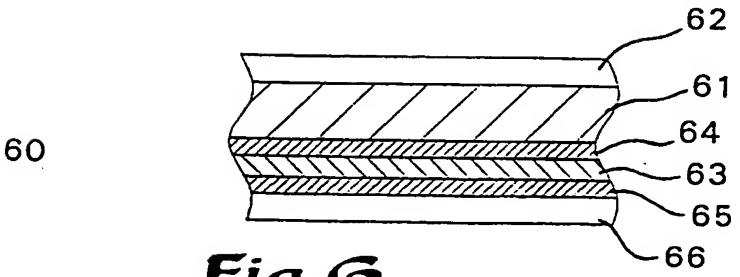

Fig 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/02165

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65D 65/40, B65D 5/62, B32B 27/32 // C08L 23/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B32B, B65D, C08L, C08J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	EP 7646679 A1 (WOLFF WALSRODE AG), 26 March 1997 (26.03.97), page 9, line 38 - line 48, abstract, claims 1-3 and 11, abstract --	
X,P	File WPI, Derwent accession no. 97-196761, Dainippon Printing Co Ltd: "Laminates used for bottles, boxes and packaging- consisting of base film, anchor coating, blending resin layer contg. LDPE and another blending resin layer", JP,A,9052329, 970225, DW9718 --	1-11

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 March 1998	26 -03- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Monika Bohlin Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/02165

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9501250 A1 (THE DOW CHEMICAL COMPANY), 12 January 1995 (12.01.95), page 7, line 27 - line 32; page 15, line 26 - line 31; page 18, line 18 - line 21; page 19, line 24 - line 28, examples 13-27, claims 1 and 12, abstract --	1-11
X	File WPI, Derwent accession no. 96-515138, Mitsui Petrochem Ind Co Ltd: "Polyethylene compsns. for composite film - contain ethylene alpha olefin random copolymer and low density polyethylene", JP,A,8269270, 961015, DW9651 --	1-11
X	WO 9513321 A1 (EXXON CHEMICAL PATENTS INC.), 18 May 1995 (18.05.95), page 3, line 30 - line 36; page 12, line 9 - line 16, examples 36-37, claims, abstract --	1-11
A	WO 9500333 A1 (AMERICAN NATIONAL CAN COMPANY), 5 January 1995 (05.01.95), claims 1-3 and 14-15, abstract -- --------	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/03/98

International application No.
PCT/SE 97/02165

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		FI 956302 A	28/12/95
		JP 8512002 T	17/12/96
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		US 5674342 A	07/10/97
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		EP 0728160 A	28/08/96
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		US 5530065 A	25/06/96
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		EP 0706455 A	17/04/96
		JP 9502401 T	11/03/97